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A Dynamic Model of a Simulated Livestock-Meat Economy

By Richard J. Crom and Wilbur R. Maki

AS A MEANS of studying historical and projected changes in market organization and structure, a dynamic model of the livestock-meat economy during 1955-64 has been developed.[1] It can be used to trace out the effect on prices, slaughter, foreign trade, and January 1 livestock numbers resulting from an assumed change in Government or industry policy. Use of this model depends on the electronic computer. In fact, the computer is an additional tool in building the model--it allows the researcher limited control of the performance of the model throughout its development.

Early studies of the livestock-meat economy used the single-equation approach--still a useful research technique in spite of the development of simplified solution methods for systems of simultaneous equations. Simultaneous equations have been used in economic research not only because of statistical problems of correlation between the explanatory variables and the disturbance term but also because many economic variables are determined simultaneously. However, new problems were introduced with simultaneous systems.[2] For example, variables must be excluded or aggregated to meet identification requirements. In addition, estimation of the structural parameters not only limits the variables used but also requires complex and costly methods. Furthermore, because of time lags involved, many responses are not simultaneous--particularly when fairly short time periods are considered.

The model to be presented is not simultaneous but recursive, except that beef and pork prices are jointly determined. Recursiveness is maintained by restricting endogenous variables either to those that are functions of lagged variables or to those that may be estimated sequentially. When simultaneous solutions are necessary, several methods are available. One method is the use of a small block of simultaneous equations. Modern computers also make an iterative solution possible; for example, in a demand equation where the beef and pork price equations each contain the other price as an explanatory variable. Also, one equation may be solved algebraically in terms of the other by substituting one equation for the competing price variable in the other equation.

Because livestock production involves substantial delays between breeding and slaughter, the sequential nature of a recursive model better portrays the cause-and-effect relationships than a simultaneous system, especially when short periods of time are used. The shorter the time period, the more current production depends on decisions made in the past and the more recursive the model is--the more lagged reactions reflect cause-and-effect sequences. Thus, a model's recursive properties very closely reflect the biological production processes and short-term decision procedures.

Primary validation of the model is its ability to reproduce as closely as possible the "real world" using reported logical time series on selected economic phenomena. The degree of correlation can be easily determined by plotting estimated values against reported values, although more precise indicators may be

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[1] This paper is based on research conducted cooperatively by the USDA and the Iowa Agr. and Home Econ. Expt. Sta., Ames, Iowa, Project No. 1462.

[2] For a more complete discussion of simultaneous versus recursive systems see H. Wold and L. Jureen, Demand Analysis, New York, John Wiley and Sons, 1953; L. R. Klein, "Single equation versus equation system methods of estimation in econometrics," Econometrica, Vol. 28, pp. 866-871, 1960; and C. F. Christ, "Simultaneous equations, estimation, any verdict yet," Econometrica, Vol. 28, pp. 835-845, 1960.

employed.[3] The graphic method of validation provides for acceptance of a model when reproduction of reported values of the variables satisfies the researcher. Proper estimation of individual equations can compensate for the major weakness of the recursive model--the lack of a statistical measure of the overall variance.

This model of the livestock-meat economy deals with its two principal components--the beef and pork sectors. In building the model of the beef and pork sectors a series of relationships among selected variables was diagrammed in considerable detail. These relationships generally were estimated by single-equation, least-squares regression. Time series data were employed, but we also had the option of using cross-sectional and engineering data, as well as simple rules of thumb. The diagram served as a flow chart in ordering the individual relations in the computer program.

One "loop" in the computer program estimated the economic activity of both sectors of the livestock-meat economy for 1 year. The computer was programmed to operate the model over 9 years (1955 to 1964). Reported values of all lagged endogenous variables and all exogenous variables were in the first loop or year. In subsequent years, the values of endogenous variables estimated during the first year provided the input for the explanatory variables.

Subsequent trial runs over the historical period allowed modification of component relations until more precise estimates of component relations were obtained. These modifications involved changes in the length of the time lag, coefficient adjustments, limiting values, and explanatory variables.

The Economic Structure

The economic structure of the beef and pork sectors is presented in figures 1 and 2. The causal ordering is shown in the flow diagrams. The coefficients of the behavioral relations are presented in the appendix.

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[3] Richard E. Suttor and Richard J. Crom, "Computer Models and Simulation," Jour. Farm Econ., Vol. 46, No. 5, pp. 1341-1350.

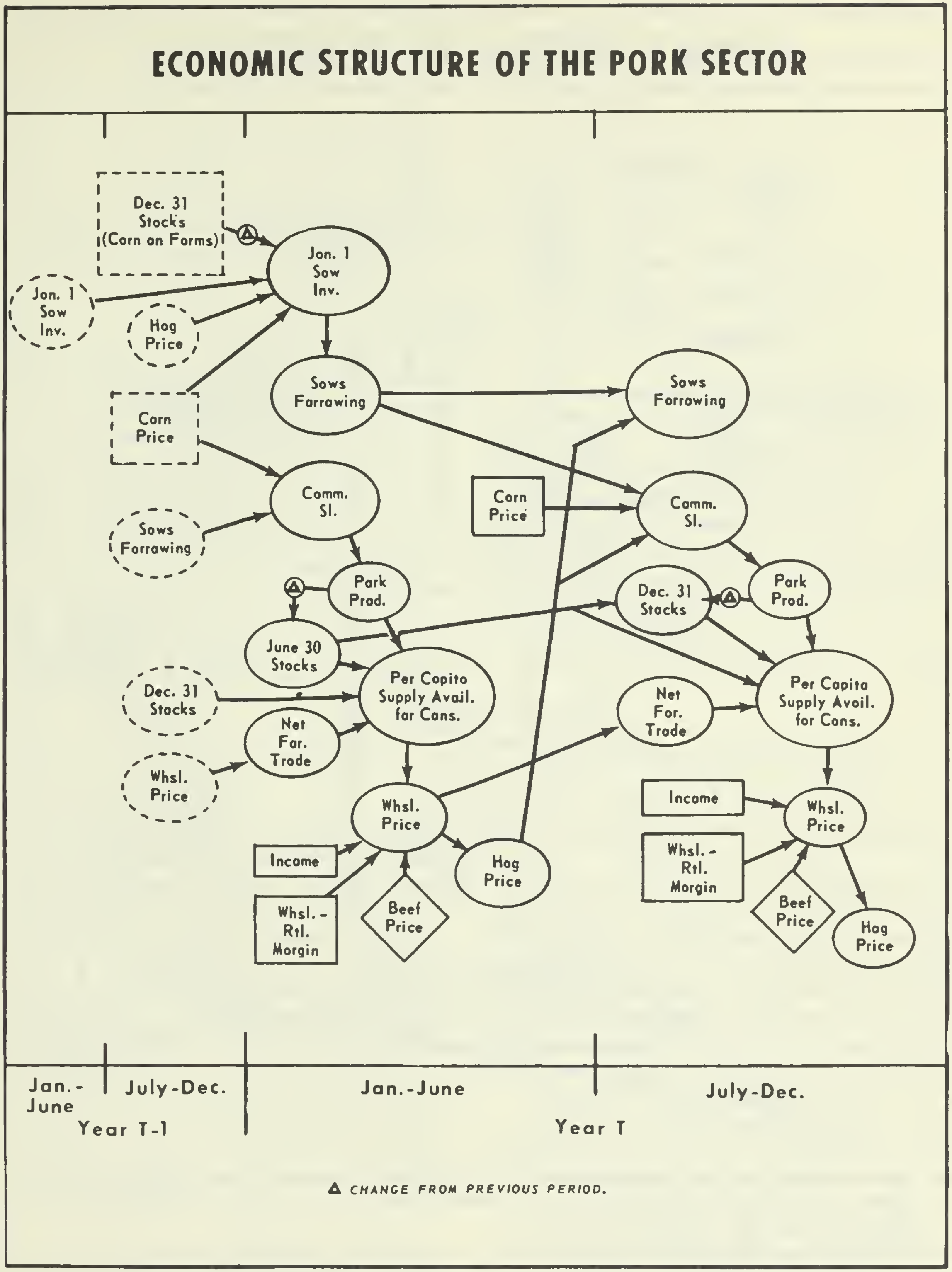
The economic structure of the pork sector is presented in figure 1. Endogenous variables are depicted by circles and exogenous variables are depicted by squares. Interaction between endogenous variables is shown by a diamond-shaped notation. The broken lines denote lagged variables.

Pork Sector: Numbers of sows and gilts on farms January 1 are accounted for by the corn-hog ratio of the previous year and the January 1 farm stocks of corn. The coefficient for the January 1 inventory of sows and gilts is estimated in two parts. When the corn-hog ratio exceeds 20, the coefficient is reduced from 252 to 240. Similarly, the coefficient is reduced if the ratio falls below 11. It can be argued that, with an exceptionally high ratio, producers show less price response because they do not expect this favorable ratio to hold. Conversely, when the ratio is exceptionally low, producers strive to maintain their breeding herds.

The January 1 inventory of sows and gilts is highly correlated with the number of sows to farrow from December through May. In turn, these spring farrowings, along with the corn-hog ratio, establish the level of fall farrowings. In addition, a trend effect occurs that accounts for a shift toward year-round farrowings. The computer program for the model was modified, however, to prevent fall farrowings from exceeding spring farrowings. Also, an intercept adjustment was made that improved the model's predictive ability.

Since it takes approximately 6 months to raise a pig to slaughter weight, pigs produced by sows farrowing the last 6 months of the year plus cull sows make up the commercial slaughter of the first half of the year. Corn and hog prices of the previous 6 months also affect commercial slaughter; they influence both the cull rate of sows and the retention of gilts for breeding purposes.

Pork production follows from commercial slaughter. Ending stocks change from their previous level when pork production increases or decreases. In the model, however, ending stocks of neither pork nor beef are allowed to fall below minimum "pipeline" levels. Finally, net foreign trade (imports minus exports) is depicted as a function of lagged wholesale price.



ECONOMIC STRUCTURE OF THE PORK SECTOR
Dec. 31 Stocks (Corn on Farms)
Jan. 1 Sow Inv.
Jan. 1 Sow Inv.
Hog Price
Corn Price
Sows Farrowing
Sows Farrowing
Comm. Sl.
Sows Farrowing
Corn Price
Comm. Sl.
Pork Prod.
Dec. 31 Stocks
Pork Prod.
June 30 Stocks
Per Capita Supply Avail. for Cons.
Dec. 31 Stocks
Net For. Trade
Net For. Trade
Per Capita Supply Avail. for Cons.
Whsl. Price
Whsl. Price
Income
Income
Whsl. Price
Whsl.-Rtl. Margin
Hog Price
Beef Price
Whsl.-Rtl. Margin
Beef Price
Hog Price
Jan.-June
July-Dec.
Year T-1
Jan.-June
July-Dec.
Year T
CHANGE FROM PREVIOUS PERIOD.

Figure 1

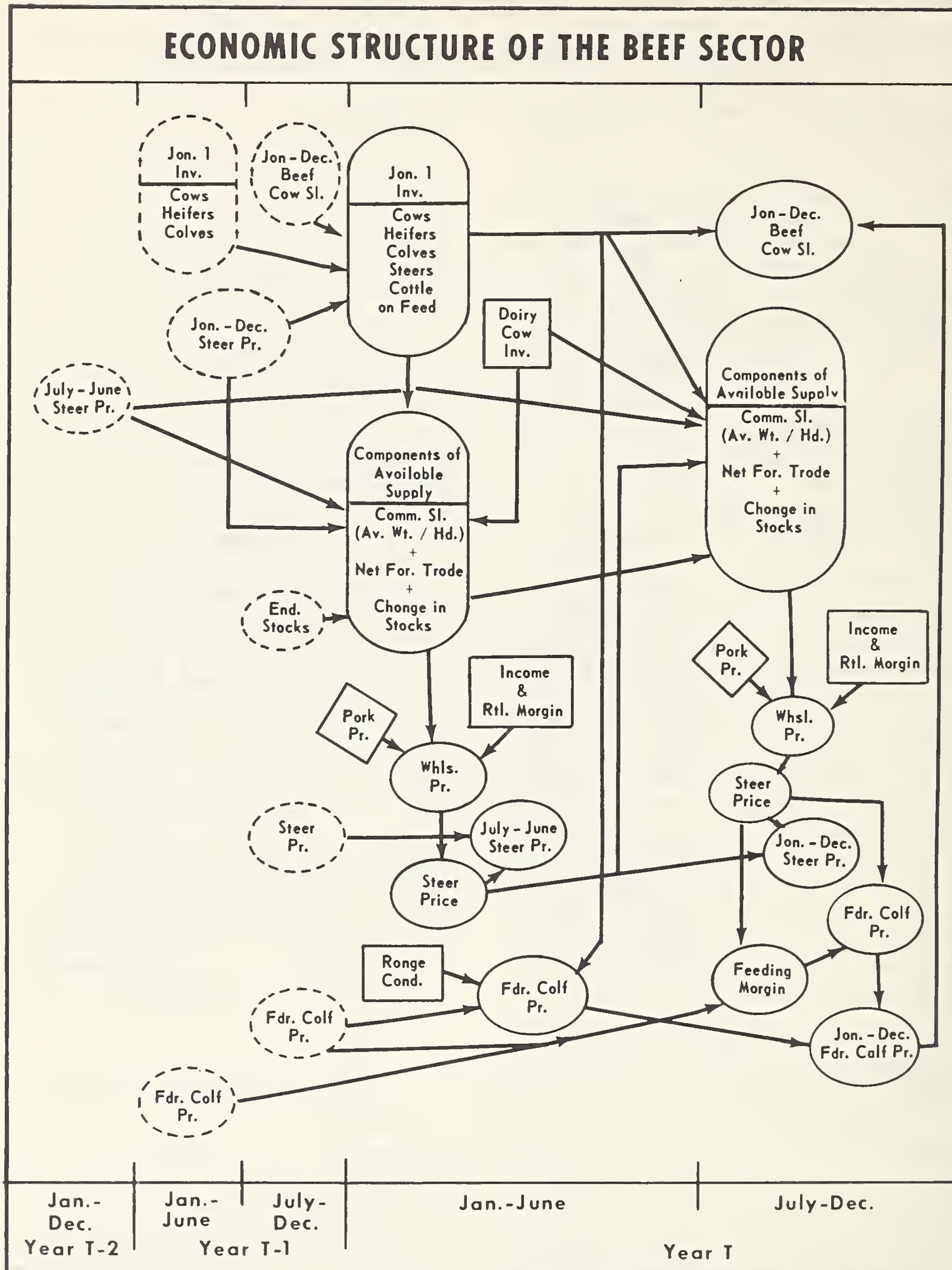

ECONOMIC STRUCTURE OF THE BEEF SECTOR
Jon. 1 Inv.
Cows Heifers Colves
Jon - Dec. Beef Cow Sl.
Jon. 1 Inv.
Cows Heifers Colves Steers Cottle on Feed
Jon - Dec. Beef Cow Sl.
Jon. - Dec. Steer Pr.
Doiry Cow Inv.
July - June Steer Pr.
Components of Avoiloble Supply
Comm. Sl. (Av. Wt. / Hd.) + Net For. Trode + Chonge in Stocks
Components of Avoiloble Supply
Comm. Sl. (Av. Wt. / Hd.) + Net For. Trode + Chonge in Stocks
End. Stocks
Pork Pr.
Income & Rtl. Morgin
Whls. Pr.
Pork Pr.
Income & Rtl. Morgin
Whsl. Pr.
Steer Price
Steer Pr.
July - June Steer Pr.
Jon. - Dec. Steer Pr.
Steer Price
Fdr. Colf Pr.
Ronge Cond.
Fdr. Colf Pr.
Feeding Morgin
Fdr. Colf Pr.
Jon. - Dec. Fdr. Calf Pr.
Fdr. Colf Pr.
Jan.- Dec. Year T-2
Jan.- June
July- Dec.
Year T-1
Jan.-June
July-Dec.
Year T

Figure 2

Thus, the supply of pork available for civilian consumption may be determined as an identity--ending stocks of the previous period plus commercial pork production and the foreign trade balance, minus ending stocks and military consumption. The wholesale price of pork is a function of per capita pork consumption, wholesale beef price, income, the retail margin, and a trend term which represents shifts in consumer tastes. The retail margin is viewed as an exogenous variable inasmuch as it is largely determined by wages and other exogenous elements.

Beef Sector: The economic structure of the beef sector used in the computer model is much more complex than that of the pork sector (fig. 2). The inventory classification of an animal changes every year, with the exception of cows, bulls, and a few 2-year-old steers. Since cows retain the same classification for several years, they are considered the basic pool of breeding stock to which heifers are added and from which cows are culled. The inventory of beef calves less than 1 year old is related to cow numbers the previous year and the preceding year's feeder calf price. January inventories of beef heifers, steers, and cattle on feed are determined by the calf inventory the previous year and either the slaughter steer or feeder calf price of the preceding year.

In the January 1 cattle inventory equations, the coefficient associated with the lagged feeder calf or slaughter steer price is decreased if the price either falls below or exceeds its critical values. At low price levels, price response is reduced as producers attempt to maintain inventory levels. At high prices, the response to price is reduced as producers expect prices to return to lower levels. These critical turning points were established in the study by successive computer runs over the historical period. Each relationship has its own critical levels; lower levels are between \$21 and \$25 while upper levels are near \$28 for slaughter price and \$32 to \$33 for feeder calf price.

Cow inventories (both beef and dairy) and steer and bull inventories account for a substantial part of commercial cattle slaughter. Inasmuch as commercial slaughter is considered on a liveweight basis in the model, the average weight of steers enters into its determination.

Initially, commercial cattle slaughter is estimated by a least-squares regression of the following form:

$$Y_t = a+b\Delta^2 X1_t + cX2_t + d\Delta^2 X3_{t-1}$$

where

X1 = January 1 beef cow numbers,

X2 = January 1 steer and bull numbers,

X3 = Annual feeder calf prices.

This relationship explained 93 percent of the variation in commercial slaughter. However, use of this relationship in the computer model led to an unstable, explosive system.

Several alternative relations were employed to improve the performance of the computer model. Since the bulk of commercial slaughter comes from slaughter of cattle on hand January 1, the following residual was calculated:

$$R = \text{Commercial slaughter} - aX1 - bX2 - cX3,$$

where

X1 = January 1 dairy cow numbers,

X2 = January 1 beef cow numbers,

X3 = January 1 steer and bull numbers.

The coefficients a, b, and c represent average cull or disposal rates over the cattle cycle. This residual still contains the year-to-year variation. It was fitted by least squares to the explanatory variables of the slaughter steer price lagged 2 years and the average weight of steers weighted by the proportion of January 1 steer inventories to cow inventories.

Computer experimentation with the model revealed that the 2-year lagged supply price enters into slaughter determination in addition to the 1-year lagged price effects already incorporated in the inventory variables. Although the 2-year lag seems somewhat long, it is logical in that the price before the summer breeding season influences the number of cows bred in year t-2. These calves are part of the calf crop of year t-1 and are ready for slaughter in both halves of year t.

The use of a weighted average inventory level introduces a nonlinear element in the independent variable. The negative coefficient supports the hypothesis that, under normal conditions, steers are fed to heavier weights when cattle numbers are relatively low. Allowance for the average disposal of inventories reduces the problem of multicolinearity among the inventory components and also allows more variation in the dependent variable. This form of the relationship stabilizes the model and yields more accurate estimates of commercial cattle slaughter.

The average weight of steers fluctuates with the change in steer numbers, the beef-corn price ratio the previous half year, and a trend term. A favorable beef-corn ratio encourages feeding to heavier weights while the trend term indicates a change in the ratio of fed to nonfed steers.

The components of the identity for determining the supply of beef available for consumption--beef stocks, beef production, and net foreign trade--are comparable with those in the pork consumption identity. The wholesale and live price relations are also similar to those of the pork sector.

Feeder price in the second half of the year changes with the direction of slaughter steer prices. If slaughter steer prices are steady or rising, the slaughter-feeder price margin of the previous 6 months, the slaughter steer price, and fall range conditions can be related to changes in the feeder price. However, if slaughter steer prices decline from the previous year, the current slaughter-feeder price margin is the more appropriate variable in explaining feeder price changes. Presumably, cattle feeders scrutinize the existing margin more closely during times of falling cattle prices. Thus, feeder calf prices in the spring are essentially set by the fall feeder price, but are also affected by the change in numbers of cattle on feed January 1.

Validation of the Model

Reported and predicted values of four key variables during 1955-64 are presented in figures 3 and 4. These variables are commercial slaughter, per capita consumption, wholesale price, and January 1 beef cows on hand.

The most serious error of the model was its inability to predict the large increases in commercial cattle slaughter in early 1964 with the corresponding increase in consumption and decrease in wholesale price. Estimates of pork price also were low during 1963-64. These low estimates of pork price could be attributed to the use of the trend term.

The large error in the cattle slaughter estimate could be attributed to a combination of factors. First, the estimate of January 1 steers on hand was low. Generally, cattle feeders retain steers on feed when they expect prices to rise, which may have been the case because of low prices in late 1963. The carryover increased average slaughter weights, thus adding to the error in the commercial slaughter estimate. If the coefficient associated with lagged price in the average slaughter weight equation were increased when price fell below a predetermined level, the cattle slaughter estimate would be improved. These two cases illustrate the type of adjustment made in the final stages of developing the model.

Summary and Conclusions

The recursive nature of the model allows the use of single equations in obtaining initial estimates of behavioral relations. The computer offers a means of observing the interaction of these individual equations as the model attempts to approximate the reported prices and outputs of the industry. In this type of model building, the researcher may interact with the computer in developing new behavioral relations or in modifying initial estimates of coefficients, until a model is obtained that will reproduce the historical period given only the value of prices and outputs at the beginning of the period. The unique feature of this type of model is its ability to use different coefficients, different variables, and different time lags depending on preassigned rules.

After validation, the model may be rerun on the computer under assumed changes in economic structure based on proposed Government programs, or shifts in any of the specified

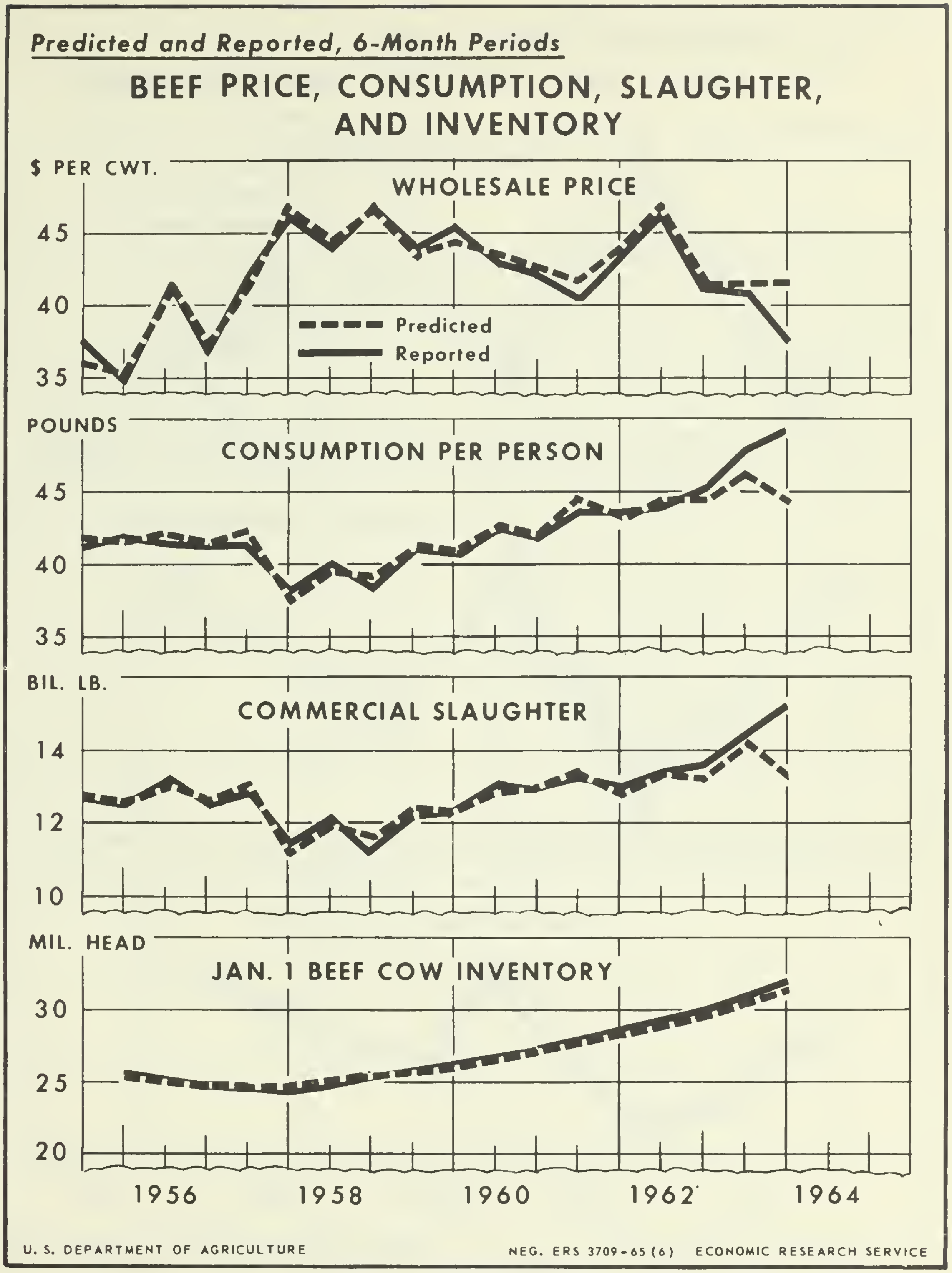

Predicted and Reported, 6-Month Periods
BEEF PRICE, CONSUMPTION, SLAUGHTER, AND INVENTORY
$ PER CWT.
WHOLESALE PRICE
45
40
35
Predicted
Reported
POUNDS
CONSUMPTION PER PERSON
45
40
35
BIL. LB.
COMMERCIAL SLAUGHTER
14
12
10
MIL. HEAD
JAN. 1 BEEF COW INVENTORY
30
25
20
1956
1958
1960
1962
1964
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Figure 3

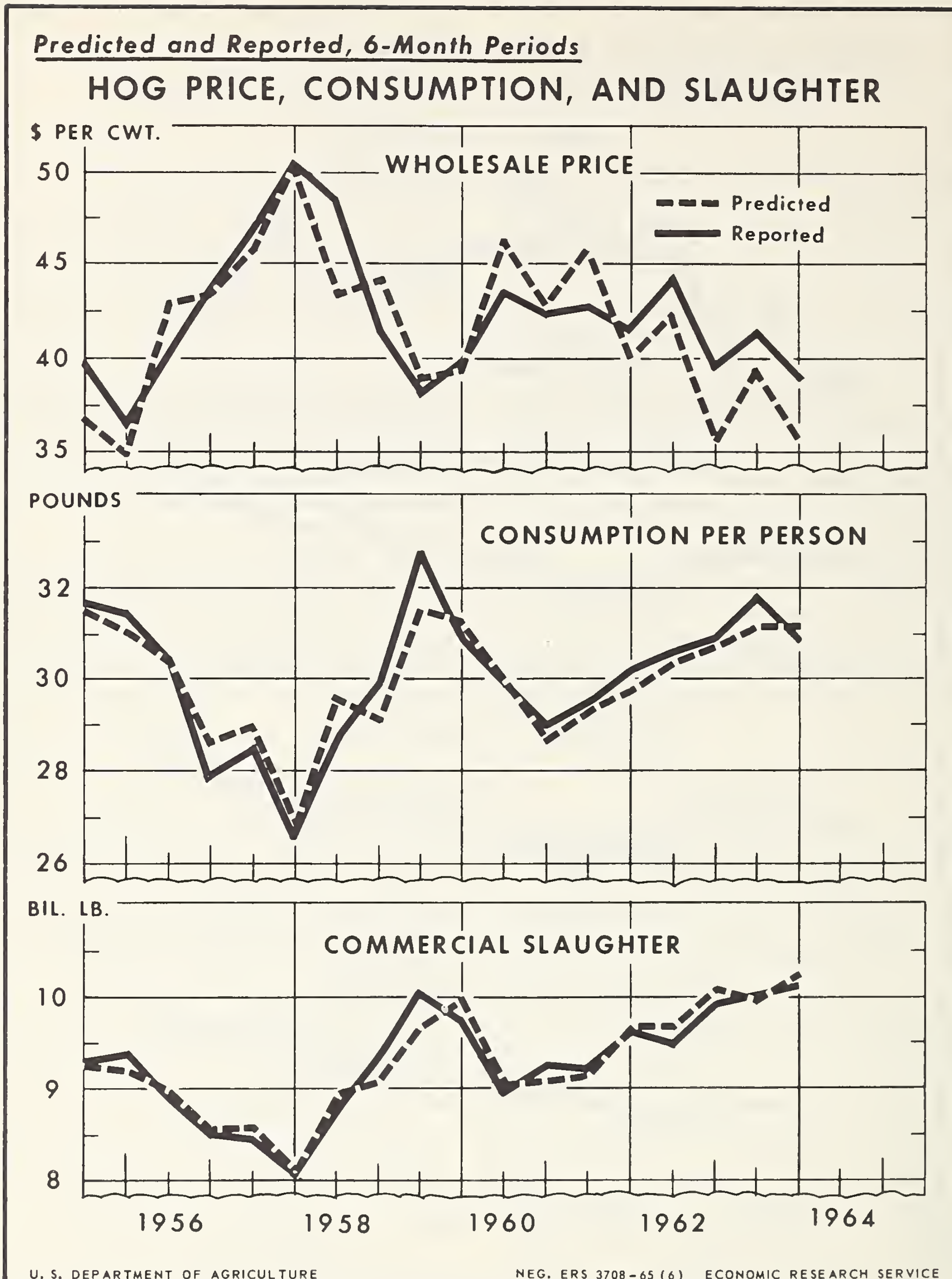
Predicted and Reported, 6-Month Periods
HOG PRICE, CONSUMPTION, AND SLAUGHTER
$ PER CWT.
WHOLESALE PRICE
Predicted
Reported
50
45
40
35
POUNDS
CONSUMPTION PER PERSON
32
30
28
26
BIL. LB.
COMMERCIAL SLAUGHTER
10
9
8
1956
1958
1960
1962
1964
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Figure 4

economic circumstances. Thus, years of economic activity can be simulated on the computer in a few minutes. Alternatively, the effects of new values of exogenous variables such as a different rate of income or population growth may be evaluated under the existing structure.

Several uses of the model for projection purposes are also possible. First, the existing model which represents the historical period may be simulated on the computer for as many years into the future as desired, provided independent projections of exogenous variables are available. At the beginning of the projection run, prices and output for the most recent year available are read into the computer as initial conditions. All of the assumed changes in the economic structure mentioned in the preceding paragraph also could be simulated as alternative projections. One of the desirable features of the recursive model is that the time paths of all prices, slaughter, year-end inventories, and imports are generated. In many cases, the evaluation of the projected time paths of these variables may be more important than their projected value for the end of the period. To be used in prediction, however, the model should contain a means of forming expectations of future prices and outputs and then use these expectations (as producers do) in adjusting current output and in making production plans.

Two areas of work are currently underway in further development of the model. One is conversion of the model from a semiannual to a quarterly basis. The second involves inclusion of regional components.

Appendix: Basic Relationships in the Model

The 30 behavioral relationships are presented in exhibits A and B for readers interested in the actual coefficients, the rules for their modification, and the values of the modified coefficients. The reader is referred to figures 1 and 2 for the causal ordering of the relationships. Standard errors of coefficients of equations estimated by regression techniques are omitted; however, one asterisk (*) denotes a t value significant at the 5 percent probability level while two asterisks (**) denote a t value significant at the 1 percent probability level.

The notation used to identify variables is shown beside each group of relationships. When the same relationship is used to estimate a variable for both halves of the year, the subscript j is used, with j = 1 for the January-June period and j = 2 for the July-December period. Trend terms are used having both annual and semiannual increments. "T" equals 1 in 1949 on an annual increment basis in relationships where the dependent variable is denoted as X_t; however, "T" equals 1 in the first half of 1949 on a semiannual increment basis in relationships where the dependent variable is denoted as X_{jt}.

EXHIBIT A

I. Inventory Relationships

$H21_t = -11,990.0 + 1.077^{**}\,H23_{t-1} + 166.2^{**}\,P2FC_{t-1}$ $\quad R^2 = 0.97$

If $P2FC_{t-1} < 22.0$ or > 35.0, reduce coeff. to 155.0

$H22_t = -3,418.0 + 0.3361^{**}\,H21_{t-1} + 142.4^{*}\,P2L_{t-1}$ $\quad R^2 = 0.90$

If $P2L_{t-1} < 23.0$ or > 28.5 reduce coeff. to 135.0

$H23_t = H23_{t-1} + H22_{t-1} - 3,197.0 + 1.036^{**}\,F1BCN_{t-1} - 1,103.0^{**}\,W$ $\quad R^2 = 0.99$

R^2 for portion fitted as residual. W=1 for 1959 & later years.

$H24_t = -4,017.0 + 0.7061^{**}\,H21_{t-1} + 81.26^{**}\,P2FC_{t-1}$ $\quad R^2 = 0.99$

If $P2FC_{t-1} < 22.0$ reduce coeff. to 70.0; if $P2FC_{t-1} > 35.0$, increase coeff. to 95.0

$H26_t = -6,132.0 + 0.5735^{**}\,H21_{t-1} + 70.96^{**}\,P2FC_{t-1}$ $\quad R^2 = 0.96$

If $P2FC_{t-1} < 24.5$, reduce coeff. to 65.0; if $P2FC_{t-1} > 35.0$ reduce coeff. to 60.0

$\Delta H32_t = -3,360.0 + 252.9^{**}\,(P3L/P6)_{t-1} - 2.68^{**}\,\Delta HF6_t$ $\quad R^2 = 0.88$

If $(P3L/P6)_{t-1} < 11.0$ or > 20.0, reduce coeff. to 240.0

$SF31_t = -165.0 + 0.9206^{**}\,H32_t$ $\quad R^2 = 0.97$

$SF32_t = -3,200.0 + 0.7329^{**}\,SF31_t + 82.0\,(P3L/P6)_t + 210.4\,T$ $\quad R^2 = 0.88$

T = 1 in 53, annual basis; if $(P31L/P21L)_t < 0.50$ change intercept to $-3,000$;

if $(P31L/P21L) > 0.75$, change intercept to $-3,400$

II. Slaughter, Meat Production, and Average Weight Relationships

$CS31_t = 284.0 + 1.334^{**}\,SF32_{t-1} - 57.57^{*}\,P32L_{t-1} + 1198.0^{*}\,P62_{t-1} + 72.90^{*}\,T$ $\quad R^2 = 0.96$

$CS32_t = 99.0 + 0.7764^{**}\,SF31_{t-1} - 16.10\,P31L_t + 861.4^{*}\,P61_t + 238.6^{**}\,T$ $\quad R^2 = 0.94$

$CS21_t = 0.1125\,H13_t + 0.0663\,H23_t + 0.55\,H24_t - 3,460.0 + 295.9^{**}\,P2LFS_{t-2} - 0.8592\,\Delta H13_{t+1} - 1.51^{**}\,NW21_t$ $\quad R^2 = 0.89$[a]

$CS22_t = 0.1125\,H13_t + 0.077\,H23_t + 0.50\,H24_t - 2,645.0 + 236.5^{**}\,P2LFS_{t-2} - 1.005^{**}\,\Delta H13_{t+1} - 0.84^{**}\,NW22_t$ $\quad R^2 = 0.97$[a]

$BP2_{jt} = 103.0 + 0.501^{**}\,CS2_{jt} + 31.5^{**}\,T$ $\quad R^2 = 0.98$

$PP3_{jt} = 256.0 + 0.5258^{**}\,CS3_{jt} + 9.576^{**}\,T$ $\quad R^2 = 0.99$

$F1C21_t = 2,257 - 0.3084^{*}\,\Delta^2\,H23_t + 21.84^{*}\,\Delta^2\,P21FC_t$ $\quad R^2 = 0.80$

$FIC22_t = 4,874 + 0.905^{**}\,F1C21_t - 53.10\,RANGE_t$ $\quad R^2 = 0.79$

$FIBCN_t = 0.08410\,H23_t + 4,316.0 - 125.9^{**}\,P2FC_t - 210.6^{**}\,T$ $\quad R^2 = 0.98$[a]

$AWFS2_{jt} = 928.0 + 5.296^{**}\left(\frac{P2_jL}{P6_j}\right)_{t-1} + 3.047^{**}\,T + 0.01652^{*}\,H24_t$ $\quad R^2 = 0.90$

[a] Refers to percentage of variation explained in that portion of the relationship estimated by least squares.

Description of Variables

January 1 Inventory (1,000 hd.)

H13 = Dairy cows.
H21 = Beef calves less than 1 yr. old.
H22 = Beef heifers 1-2 yr. old.
H23 = Beef cows.
H24 = Steers and bulls over 1 yr. old.
H26 = Cattle on feed, 26 States.
H32 = Sows and gilts over 6 mo. old.
HF6 = Stocks of corn on farms (1,000 bu.)

- -

Sows Farrowing (1,000 hd.)

SF31 = December-May.
SF32 = June-November.

- -

Slaughter (mil. lb., live wt.)

$CS3_j$ = Hogs, commercial.
$CS2_j$ = Cattle, commercial.
$FIC2_j$ = Cows, federally inspected.
F1BCN = Cows, federally inspected. (1,000 hd., annual basis)

- -

Meat Production (mil. lb., carcass wt.)

$BP2_j$ = Beef, commercial.
$PP3_j$ = Pork, commercial.

Prices, (annual average, dol. /cwt.)

P2L = Choice steers, Chicago.
P3L = No. 1-3, 200-220 lb. hogs, Chicago.
P2LFS = July-June average, Choice steers, Chicago.
P2FC = G&C, 300-500 lb. feeder calves, Kansas City.
P6 = No. 3 corn, Chicago (per bu.)
(Pi_j notation indicates semiannual average)

- -

$AWFS2_j$ = Av. steer wt., federally inspected.
$NW21 = ((0.50\,H24_t) / (0.1125\,H13_t + 0.063\,H23))\,AWFS21$
$NW22 = ((0.55\,H24_t) / (0.1125\,H13_t + 0.077\,H23_t))\,AWFS22$
RANGE = Oct. 1 range conditions, 17 States.

EXHIBIT B

III. Foreign Trade and Ending Stocks Relationships

$FTR2_{jt} = -142.0 + 8.66^{*}\ PWB2_{jt-1} - 0.988^{**}\ FIC2_{jt-1} + 16.45^{**}\ T + 250.0\ W$ $\quad R^2 = 0.74$

W = 1 for 1959 and later years. If $PWB22_{t-1} < 35.0$, reduce coeff. to 6.0; If $PWB21_{t-1} < 38.0$, reduce coeff. to 6.0

$FTR3_{jt} = -156.0 + 2.321^{*}\ PWP3_{jt-1} + 3.93^{*}\ T$ $\quad R^2 = 0.68$

$ES31_t = -134.0 + 0.477^{*}\ ES31_{t-1} + 0.1152^{**}\ \Delta PP31_{t-1}$ $\quad R^2 = 0.68$

$ES32_t = 68.0 + 0.6245^{**}\ ES32_{t-1} + 0.1020\ \Delta PP32_{t-1}$ $\quad R^2 = 0.80$

$\Delta ES2_{jt} = 0.04829^{**}\ \Delta^2\ CS2_{jt}$ $\quad R^2 = 0.80$

If est. $ES2_{jt} < 100.0$, $ES2_{jt} = 100.0$

IV. Demand and Margins Relationships

$PWB2_{jt} = 123.57 - 2.0467^{**}\ QPH2_{jt} - 0.5389^{*}\ QPH3_{jt} - 1.194^{**}\ RM2_{jt} - 0.9591^{*}\ RM3_{jt} + 0.0101\ YPH_{jt} + 0.9772^{**}\ T - 2.84^{**}\ W$ $\quad R^2 = 0.99$

If $(FIC2_j / CS2_j) > 0.25$ add 1.00; if $(FIC2_j / CS2_j) < 0.16$, subtract 1.00; W = 1 for j = 1.

$PWP3_{jt} = 49.44 - 3.1218^{**}\ QPH3_{jt} - 0.55\ RM3_{jt} + 0.4073^{**}\ PWB2_{jt} + 0.0612^{**}\ YPH_{jt} - 1.7515\ T - 4.30^{**}\ W$ $\quad R^2 = 0.92$

W = 1 for j = 1.
Both demand equations were fitted quantity dependent. R^2 and t tests based on original equations.

$P2_jL_t = -1.50 + 0.6397^{**}\ PWB2_{jt} - 0.0145^{**}\ OM_{jt}$ $\quad R^2 = 0.99$

$P3_jL_t = -2.97 + 0.5749^{**}\ PWP3_{jt} - 0.0284^{**}\ OM_{jt}$ $\quad R^2 = 0.95$

$P21FC_t = -19.55 + 1.10\ P22FC_{t-1} - 0.004\ \Delta H26_t + 0.25\ AMRGE$

$P22FC_t = -33.50 + 1.25\ P22L_t + 0.20\ RANGE_t + 0.50\ PM_t$

Use this relation when $\Delta P22L_t \geq -1.25$

and $PM_t = 1.615\ P21L_t - 0.615\ P21FC_{t-1}$

$P22FC_t = -37.00 + 1.5\ P22L_t + 0.2\ RANGE + 0.4\ PM_t$

Use this relation when $\Delta P22L_t < -1.25$

and $PM_t = 1.615\ P22L_t - 0.615\ P22FC_{t-1}$

Description of Variables

Million lb., carcass wt.

$FTR2_j$ = Beef, imports minus exports.
$FTR3_j$ = Pork, imports minus exports.
$ES2_j$ = Ending stocks, beef.
ES31 = June 30 stocks, pork.
ES32 = Dec. 31 stocks, pork.
PP31 = Pork, prod., Jan.-June.
PP32 = Pork prod., July-Dec.

Million lb., live wt.

$FIC2_j$ = Fed. inspected cow slaughter.
$CS2_j$ = Commercial cattle slaughter.

Per Capita Consumption, lb.

$QPH2_j$ = Beef, carcass wt.
$QPH3_j$ = Pork, carcass wt.

Prices, dol./cwt., live wt.

$P2_jL$ = Choice steers, Chicago.
$P3_jL$ = No. 1-3 hogs, 200-220 lb., Chicago.
P21FC = G&C, 300-500 lb. calves, Kansas City, Jan.-July.
P22FC = G&C, 300-500 lb. calves, Kansas City, July-Dec.

Prices and values, dol./cwt., carcass wt.

$PWB2_j$ = Wholesale, Choice beef, Chicago.
$PWB3_j$ = Wholesale value 100 lb. pork, Chicago.
$RM2_j$ = Wholesale-retail spread, Choice beef, Chicago.
$RM3_j$ = Wholesale-retail spread, pork, Chicago.

H26 = Cattle on feed, Jan. 1 (1,000 hd.)
YPH_j = Per capita disposable income.
OM_j = Output/man, meatpacking, lb./hr.
RANGE = Oct. 1 range conditions, 17 States.
AMRGE = Apr.-May av., range conditions, 17 States.

The Adequate Family Farm--Mainstay of the Farm Economy

By Radoje Nikolitch

TWO CHANGES in the organization of the farm economy are basic in U.S. agriculture since World War II. One is the rapid decline in the number of farms. The other is the increasing volume of production from the remaining farms.

These changes have been the source of much confusion. They have been often misunderstood, and many times misrepresented. They have been interpreted as indicating a concentration of farm production into an ever smaller number of large farming organizations, and also as heralding the doom of the family farm[1] in American agriculture. Such interpretations, however, are mistaken. They suffer from the error of failing to take into account differences in the economic importance of these changing farms. It is somewhat similar to counting money by number of units without taking into consideration the different value of each unit.[2]

Three observations demonstrate the error of identifying the postwar changes in number, production, and size of farms with the concentration of farm production in large nonfamily businesses: First, the very small units account for most of the net decrease in number of farms. Second, farm production, land, and other resources are concentrating not in a smaller number of large farming organizations, but in a rapidly expanding number of adequate farms. Finally, the number of farms and farm production are increasing more rapidly among adequate family farms[3] than among the larger-than-family farms.

Decrease in Small Units

There were 1.2 million fewer farms in 1959 than in 1949. It is estimated that the number decreased by an additional 600,000 units from 1959 to 1964. But this decrease did not occur in all sizes of farms. From 1949 to 1959, the net decline in number of farms was entirely accounted for by a decrease in the number of small units with less than $2,500 of sales (1959 prices) representing the main livelihood and the main occupation for their operators.[4] The number of farms with $2,500 to $9,999 of sales decreased also, but at a much slower rate. Their decline was almost entirely compensated by the increase in the number of farms with $10,000 or more of sales. Thus, the total number

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[1] The essential characteristic of a family farm is not to be found in the size of its sales, acreage, or capital investment, but in the degree to which productive effort and its reward are vested in the family. The family farm is an agricultural business in which the operator is a risk-taking manager who, with his family, does more than half of the farm work. Statistical information on hired labor is ample and adequate, but very little is available on operator and family labor. However, it is estimated that the family labor supply on the average farm is about 1.5 man-years. As a convenient working definition, farms using less than 1.5 man-years of hired labor are classified in this paper as family farms, and those using more than 1.5 man-years of hired labor are classified as larger-than-family farms.

[2] For more information on problems treated in this article, see also Radoje Nikolitch, "Family and Larger-Than-Family Farms--Their Relative Position in American Agriculture," U.S. Dept. Agr., Agr. Econ. Rpt. 4, Nov. 1962; "Family Labor and Technological Advance in Farming," Jour. Farm Econ. 44: 1061-1068, Nov. 1962; "Our 100,000 Biggest Farms--Their Relative Position in American Agriculture," U.S. Dept. Agr., Agr. Econ. Rpt. 49, Feb 1964; "The Expanding and the Contracting Sectors of American Agriculture," U.S. Dept. Agr., Agr. Econ. Rpt. 74, May 1965.

[3] Adequate family farms are businesses with sufficient resources and productivity to yield enough farm income to meet expenses for (a) family living; (b) farm expenses, including depreciation, maintenance of the livestock herd, equipment, land and buildings, and interest on borrowed capital; (c) enough capital growth for new farm investments required to keep in step with technological advance and rising levels of living.

[4] Value of sales throughout this paper is in terms of 1959 prices received by farmers.

of farms with $2,500 or more of sales showed practically no change in the 1950's. There were 2,180,000 farms with $2,500 or more of sales in 1949, and 2,175,000 such farms in 1959. A fifth of the net decrease in the number of all farms for 1949-59 was accounted for by the decrease in the number of cropper units with less than $5,000 of sales. The number of noncommercial farms did not change significantly (fig. 1).

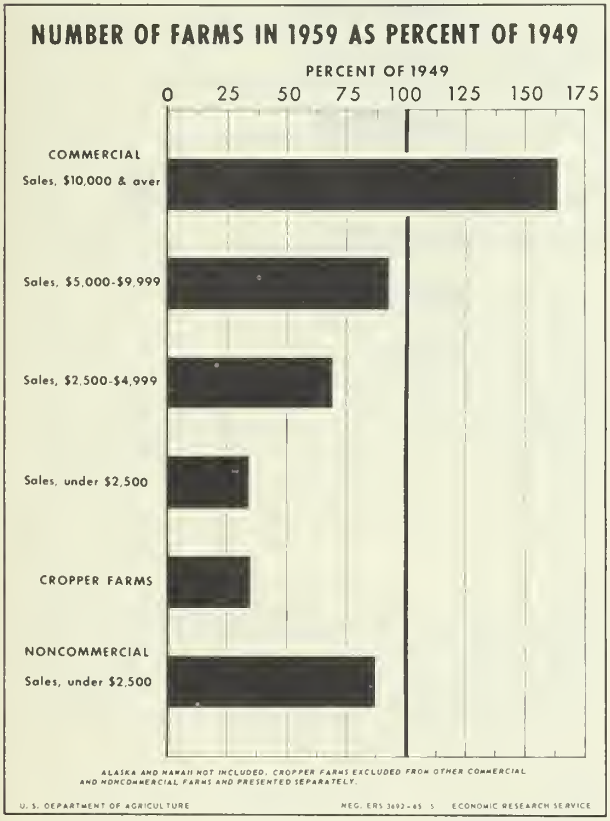

Figure 1

In 1959, the annual gross income of commercial units with gross sales of less than $2,500 was about $1,400 per farm. As a group they accounted for only 1.8 percent of the total farm marketings. These units have so few resources and such low productivity that they have little chance of being reorganized into efficient businesses. Under present technology such small units cannot survive as economic businesses, although some may provide a supplementary livelihood for their operators' families who may be employed off the farm.

The present and the future of American farming lie chiefly with the remaining farms about that size, and especially with units producing more than $10,000 of marketings.

The Expanding Number of Adequate Farms

The farm economy in the postwar period has been divided into an expanding sector of relatively large farms and a contracting sector of relatively small farms. During the 1940's, the dividing line between these two sectors fell somewhere in the group of farms with $5,000 to $9,999 of sales. During the 1950's in most of the country it rose to the group of farms with more than $10,000 of sales.[5] The boundary between the two sectors may be expected to continue to rise in line with further technological advance, higher standards of living, and higher levels of national economic progress. For the period analyzed in this paper, available data indicate that about $10,000 worth of marketings represents the dividing line between the two sectors. From 1939 to 1959, the number of farms with less than $10,000 of sales decreased 41 percent and the value of their marketings declined 19 percent. For the same period the number of farms above this level of sales increased two and a half times, and the value of their marketings more than tripled.

Four developments in the expanding sector deserve particular attention.

1. Farm production is rapidly concentrating in this sector. It accounted for 71 percent of all farm marketings in 1959, compared with only 39 percent in 1939, and 50 percent in 1949. In 1964, there were about 1 million farms in the expanding sector representing 28 percent of all farms, and accounting for 81 percent of total farm marketings. However, the concentration of production in this sector is not occurring in a smaller number of farms. The expanding sector had 77 percent more marketings by 1959 than in 1949, but it also had 67 percent more farms (table 1). Of greater significance is the change in the group of farms with $40,000 or

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[5] Except for the Appalachian, Southeast, and Delta States regions, where the dividing line was still represented by about $5,000 of sales.

Table 1.--Value of sales and acreage for the expanding and the contracting sectors of agriculture, 1959 as a percentage of 1949, total United States and per farm[1]

Item	Number of farms	Sales		Acreage	
		Total	Per farm	Total	Per farm
Expanding sector:	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
$40,000 or more of sales..............	220.8	189.3	85.7	--	--
$10,000 to $39,999 of sales...........	160.8	168.9	101.3	--	--
Total...........	166.6	177.3	106.4	137.6	82.6
Contracting sector: Less than $10,000 of sales..............	68.8	72.7	96.3	72.0	104.6

[1] Alaska and Hawaii not included. Adjusted to the more exclusive definition of farms in the 1959 Census of Agriculture.

more marketings. During the 1950's this group of farms expanded its output 89 percent while expanding its numbers 121 percent, so that output per farm decreased 14 percent.

2. In 1959, the expanding sector of farms included 56 percent of the land in farms compared to 40 percent in 1949. However, the increasing proportion of land in this expanding sector does not imply a concentration of land into a few large holdings. For, while this sector included 38 percent more land in 1959 than in 1949, it also included 67 percent more farms. Thus, the acreage per farm in the expanding sector decreased 17 percent (table 1).

3. The expanding sector of agriculture included many more tractors, livestock, acres, and other physical resources in 1959 than in 1949. But the larger quantity of resources is due more to the increasing number of farms in this sector, than to an increase in land and capital goods per farm (fig. 2).

4. The average age of farm operators is about the same as that of self-employed persons in other industries. More importantly, in this expanding sector, the number of operators is increasing rapidly in all age groups--including the youngest group of operators under 35 years of age. This, as shown in table 2, is not true in the contracting sector of farms with less than $10,000 of sales.[6]

These developments show that the national production of food and fiber is not falling into the hands of an aging group of farm operators.

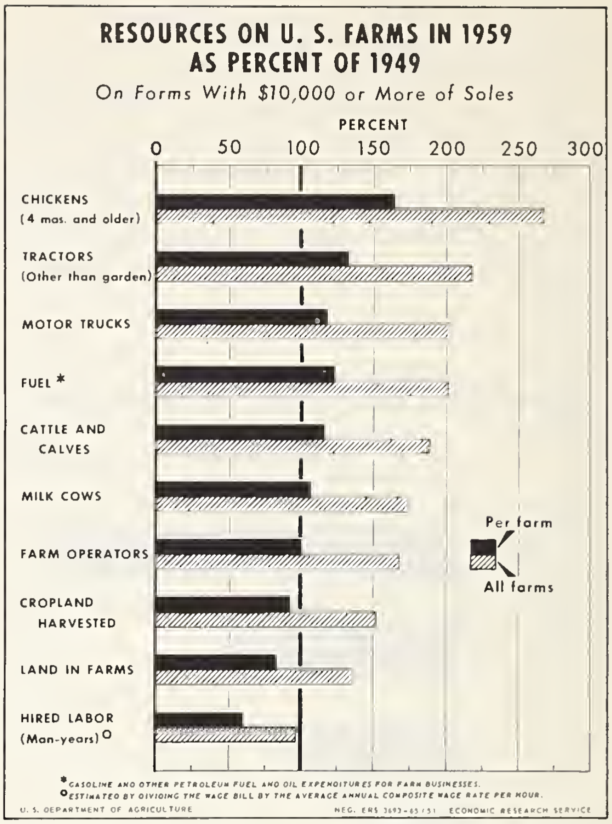

Figure 2

Table 2.--Percentage changes in number of farm operators, by age groups and size of farms in value of sales, United States, 1949 to 1959[1]

Age of farm operator and value of sales	Increase	Decrease
Under 35 years:	*Percent*	*Percent*
$10,000 or more........	44	--
Less than $10,000......	--	62
35 to 64 years:		
$10,000 or more........	81	--
Less than $10,000......	--	34
65 years or more:		
$10,000 or more........	64	--
Less than $10,000......	--	21

[1] Alaska and Hawaii not included.

Source: Census of Agriculture, Vol. 11, Chapter XI.

They also show that the concentration of farm production, farmland, and other farm resources is not occurring in a decreasing number of large businesses, but, on the contrary, in an expanding number of adequate farms.

[6] For additional information on age of farm operators and other farm workers, see Radoje Nikolitch, "The Expanding and the Contracting Sectors of American Agriculture," U.S. Dept. Agr., Agr. Econ. Rpt. 74, May 1965, pp. 19-22.

Dominance of Family Farms

If changes in the structure of farm economy indicated the decline of family businesses in farming, at least four circumstances would be appearing. First, family farms would be an increasingly smaller proportion of all farms, and would be accounting for an increasingly smaller proportion of all farm marketings. Second, family farms would be losing their dominance most rapidly in the expanding sector of adequate farms with $10,000 or more of sales. Third, hired labor would be accounting for an increasing proportion of all work done on farms. Finally, we would expect to see a considerable change in the Nation's traditional land tenure patterns. In all these respects, however, the actual findings do not indicate any decrease in the overwhelming dominance of family farms in American agriculture.

First, both the number and the production of family farms did not change significantly as proportions of all farms. In 1949, family farms accounted for about 95 percent of all farms, and for 66 percent of total farm marketings; in 1959, for about 96 percent of all farms and 69 percent of total farm marketings. Estimates for 1964 indicate about 96 percent and 73 percent respectively.

Second and more important, adequate family farms with $10,000 or more of sales are the most rapidly expanding part of the farm economy. An analysis for 1949 to 1964 shows that only family farms with $10,000 or more sales were increasing in number (table 3). There was a decline in the number of farms in all other classes, including the larger-than-family farms with $10,000 or more of sales. Farm production was increasing 14 times as fast for family farms with $10,000 or more of sales as for larger-than-family farms with the same sales (table 4).

In 1949, family farms represented 68 percent of all farms in the expanding sector, and accounted for 42 percent of marketings by the sector. In 1959, almost 82 percent of all farms in the expanding sector were family operated businesses, and they had 57 percent of the marketings. It is estimated that in 1964 family farms accounted for 88 percent of all farms with $10,000 or more of sales and for 67 percent of their marketings (table 5).

The rapid increase in the proportion of family farms and of their production is even more pronounced among the larger farms with $40,000 or more of sales. A preliminary estimate indicates that less than one-fifth of the farms in this group were family farms in 1949, compared with almost two-fifths in 1959.

The family farms with $10,000 or more of sales are classified as adequate family farms in this paper only on the basis of their economic fitness to survive the keen competition in our agriculture. No implication is intended as to the adequacy of family income on these farms. Gross sales are only one of many data needed for a study of family farm income. In that respect Harold E. Barnhill's study of 16 major types

Table 3.--Number and value of sales of family and larger-than-family farms in the expanding and contracting sectors of agriculture, United States, 1949, 1959, and estimate for 1964[1]

Class of farms and value of sales	Number of farms			Value of sales		
	1949[2]	1959	1964	1949[2]	1959	1964
	Thous. farms	*Thous. farms*	*Thous. farms*	*Mil. dol.*	*Mil. dol.*	*Mil. dol.*
Family farms:[3]						
$10,000 or more of sales	346	684	891	6,164	13,848	20,163
Less than $10,000 of sales	4,301	3,120	2,451	11,513	9,221	7,045
Larger-than-family farms:[4]						
$10,000 or more of sales	166	154	119	8,465	10,331	9,834
Less than $10,000 of sales	100	20	11	616	112	62
All farms:						
$10,000 or more of sales	512	838	1,010	14,629	24,179	29,997
Less than $10,000 of sales	4,401	3,140	2,462	12,129	9,333	7,107

[1] Alaska and Hawaii not included. Adjusted for census undercounting. Croppers not counted as independent units.
[2] Adjusted to changes in farm definition in 1959 Census of Agriculture.
[3] Farms on which families are risk-taking managers using less than 1.5 man-years of hired labor.
[4] Farms using 1.5 or more man-years of hired labor.

Table 4.--Percentage changes in number and value of sales of family and larger-than-family farms from 1949 to 1964, United States[1]

Class of farms and value of sales	Number	Value of sales
	Percent	*Percent*
Family farms:		
$10,000 or more of sales	+157.5	+277.1
Less than $10,000 of sales	-43.0	-38.8
Larger-than-family farms:		
$10,000 or more of sales	-28.3	+16.2
Less than $10,000 of sales	-89.0	-89.9

[1] Alaska and Hawaii not included.

Table 5.--Number and value of sales of family and larger-than-family farms as a percentage of total in specified sales groups, United States, 1949, 1959, and estimate for 1964[1]

Class of farms and value of sales	Number of farms			Value of sales		
	1949	1959	1964	1949	1959	1964
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Family farms:						
$10,000 or more of sales..	67.6	81.6	88.2	42.1	57.3	67.2
Less than $10,000 of sales	97.7	99.4	99.6	94.9	98.8	99.1
Larger-than-family farms:						
$10,000 or more of sales..	32.4	18.4	11.8	57.9	42.7	32.8
Less than $10,000 of sales	2.3	0.6	0.4	5.1	1.2	0.9

[1] Alaska and Hawaii not included.

of farming in 29 different farming areas is of particular interest.[7] He shows that "the amount of gross sales required on the 29 farms budgeted for operator labor and management earnings of $2,500 a year ranged from $6,750 to $26,450--on 23 of them sales exceeded $10,000. For earnings of $3,500, the range was $9,340 to $36,960. And, for earnings of $4,500 and $5,500, the range was from $11,700 to $49,230 and $14,990 to $62,100 respectively. On 20 of the farms budgeted for $5,550 operator earnings, gross sales exceeded $20,000."

Third, a judicious estimate indicates that from 1949 to 1963, the proportion of total farm work done by hired labor, on the average, declined somewhat more rapidly than the proportion done by operators and unpaid members of the family.[8]

Fourth, if family farms were losing ground to a factory farming system or to large corporate farming businesses, we would expect to find a considerable increase in the acreage of farmland operated under paid management. However, the structural changes in agriculture do not appear to be altering traditional land tenure patterns in the United States.[9] During the 1940's the proportion of land operated by owners and paid managers increased considerably owing to the favorable relationship between prices farmers received for their products and prices they paid for farm supplies. But, during the 1950's, the proportion of land operated by owners, renters, and paid managers remained stable. Throughout this period, about 55 percent of all land in farms was operated by owners, 35 percent by renters, and less than 10 percent by paid managers (table 6).

Table 6.--Land in farms operated by owners, renters, and paid managers, United States, 1924-59[1]

Year	Acreage operated by--				Percentage of total[2]			
	All operators	Owners	Renters	Paid managers	All operators	Owners	Renters	Paid managers
	Mil. acres	*Mil. acres*	*Mil. acres*	*Mil. acres*	*Percent*	*Percent*	*Percent*	*Percent*
1924[3]......	924	520	361	43	100.0	56.3	39.1	4.6
1929.......	990	494	432	64	100.0	49.9	43.7	6.4
1939.......	1,065	527	469	69	100.0	49.5	44.0	6.5
1944[3]......	1,142	605	431	106	100.0	53.0	37.7	9.3
1949.......	1,161	644	410	107	100.0	55.5	35.3	9.2
1954[3]......	1,160	656	404	100	100.0	56.6	34.8	8.6
1959.......	1,123	616	397	110	100.0	54.9	35.3	9.8

[1] For 1949, 1954, and 1959 no direct information is available in the Census of Agriculture on these three operatorship tenures. The distribution of farmland among the three tenures was estimated for these years on the basis of census data by assuming that part-owners did not subrent their rented land.

[2] Computed before rounding numbers.

[3] Alaska and Hawaii not included.

Source: Derived from Census of Agriculture, 1959, Vol. 11, Ch. X, table 16, p. 1042.

[7] Harold F. Barnhill, "Resource Requirements on Farms for Specified Operator Incomes," U.S. Dept. Agr., Agr. Econ. Rpt. 5, revised Nov. 1964.

[8] Farm labor is not separated from the control of resources used in production nor from the management of production. It is through the marketings or home consumption of its production that family labor secures a return for its work.

[9] We are speaking here of the tenure under which farmland is operated, disregarding the composition of operating units. Thus, for example, in a part-owner farm, a part of the land is owned by the operator and another part is rented.

Conclusion

The immense economic and technological progress in recent years has not changed two basic structural characteristics of American agriculture. Contrary to what has happened in other industries, farms continue to be relatively small businesses. And second, the traditional dominance of family farms continues to be as notable as ever.

Adequate family farms were, and still are, the mainstay of the American farm economy. Moreover, the evidence indicates that this dominance of family farms is increasing. It shows also that farm production is rapidly concentrating on adequate family farms.

In 1949 there were 17 family farms for each larger-than-family farm. In 1964, that ratio increased to 26 family farms for each larger-than-family farm. For every $100 of sales by larger-than-family farms in 1949, family farms marketed $195. In 1964, for every $100 of sales by larger-than-family farms, family farms sold $275 worth of farm products.

In 1949, the adequate family farms (those with $10,000 or more of sales) accounted for 7 percent of all farms and for 23 percent of total farm marketings. In 1964, they accounted for 26 percent of all farms and for 54 percent of all farm marketings.

This rapid expansion of adequate family farms is evidence that the traditional independence of American farmers is not endangered by any concentration of farm production in a few "farming factories" or in large corporate businesses in agriculture.

Family farms are getting fewer and bigger, but there is no indication of their replacement by larger-than-family farms.

Validation of Objective Method of Estimating Soybean Yield

By Charles E. Rogers and Douglas E. Murfield

TIMELY, RELIABLE measurement of annual crop production has assumed growing importance throughout the world in recent years. Because direct measurement is usually not possible, it is necessary to estimate acreage and yield, the components of production. The technique of objective yield measurement by harvesting small plots has been used since about 1940. The first extensive investigation of plot size and shape was conducted in India on wheat. Plots of about 12 square feet resulted in serious overestimation which decreased as plot size was increased. The overestimation was attributed to border bias, i.e., the tendency for samplers to include plants adjacent to but outside the plot. Measurements of other crops have shown similar bias.

In the United States considerations of variability of plant yields and costs have dictated two very small plots per sample field, and procedures to minimize border bias have been developed. The plot being used in soybean yield work consists of two 3-foot row sections, located in adjacent rows. By counting a random number of rows and paces in the sample field, the sampler reaches the plot location. When he has taken the prescribed number of places in the proper row, he places a thin dowel stick across two rows at the end of his toe. This marks the starting point for the 3-foot row sections. The length of the plot is measured in each row by sliding a steel frame into the plants in the row. This frame was designed to measure exactly the 3 feet of row to determine precisely the plants that lie within the row section. The second plot is similarly located. For the preharvest estimate of yield, the sample plots are harvested, the pods are threshed and weighed, the moisture content is measured, and the yield is computed. After harvest, other plots are laid out and gleaned to measure harvesting losses.

This validation study was conducted to determine whether or not there is appreciable bias in soybean objective yield procedures. Regular sampling personnel were employed and the same field procedures described above were used except for the number of sample plots per field.

Procedure

The Soybean Objective Yield Procedure Validation Study was conducted in the fall of 1964 in Illinois and Mississippi. For this study, 5 fields in Illinois and 7 in Mississippi were purposively selected on the basis of location, size, and expected yield. The selected fields, which ranged in size from 18 to 50 acres, were measured accurately with a surveyor's chain to obtain the acreage to be harvested. In each field, using the procedures prescribed for the regular soybean objective yield work, 100 sampling units (each a 2-row, 3-foot plot) were randomly selected and identified. Then the beans from these sampling units were harvested and sent to the regional laboratory where they were threshed and weighed, and their moisture content was determined. Within a few days after the farmer had harvested the field, post-harvest gleanings were made on 50 plots per field. Each of these plots was located 5 paces beyond an even- or odd-numbered preharvest plot and consisted of a 3-foot row section with its associated middle. Gleanings obtained from these plots were also mailed to the laboratory for threshing, weighing, and moisture testing.

As the fields were harvested by the farmer, each load was weighed and moisture tests were made. The yield for the field was computed by dividing the weight of beans harvested from the field by the measured acreage.

A sample estimate of gross yield was computed for each field from the threshed weight of beans (adjusted to harvest moisture content) harvested in the sample plots and the average

row width. An estimate of harvesting loss was derived similarly from the postharvest gleanings data and this was deducted from gross yield to obtain an estimate of net yield. Within-field variances were computed for adjusted bean weights and gleanings from the sample plots, and were used to determine the variance of the net yield per acre. For this, the two variances were summed, since the covariance calculated for several fields was near zero and this indicated there was virtually no correlation between the gross yield and harvesting loss within fields.

Analysis

In this study, the null hypothesis being tested was that the yield estimated on a weight basis obtained by harvesting sample plots following regular field procedures does not differ from the yield on a weight basis as determined by harvesting the entire field and hauling the beans to the nearest scale for weighing. Since the experiment was designed to test field procedures for bias, a wide range of conditions was selected, and the averages and variances which were pooled for all fields are of primary interest. Table 1 summarizes the yields and standard errors computed for the different fields, as well as these values pooled by States.

Table 1.--Soybean yield and acreage data by fields and States, 1964

State and field	Measured acreage in field	Net yield		Dif-ference	Standard error	Sampling error
		Harvested by farmer	Estimated from sample plots			
Illinois:	*Acres*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Pct.*
1.........	24.6	32.91	31.90	-1.01	.800	2.51
2.........	22.6	20.92	21.19	+.27	.783	3.70
3.........	32.6	33.42	33.10	-.32	.967	2.92
4.........	18.9	25.85	28.53	+2.68	.479	1.68
5.........	27.9	18.40	18.84	+.44	.585	3.10
Total..	126.5	26.66	26.93	+.27	.357	1.33
Mississippi:						
1.........	50.4	29.54	28.08	-1.46	.901	3.21
2.........	29.6	22.67	23.71	+1.04	.932	3.93
3.........	27.2	41.07	40.89	-.18	1.445	3.53
4.........	22.8	9.65	10.37	+.72	.510	4.92
5.........	24.2	14.09	13.19	-.90	1.278	9.69
6.........	20.9	19.02	22.85	+3.83	1.247	5.43
7.........	19.4	19.65	20.10	+.45	.864	4.30
Total...	194.5	23.73	23.93	+.20	.412	1.72
Two States Combined..	321.0	24.874	25.096	+.222	.287	1.14

Using the t distribution to test the significance of differences between measured and estimated yields, we obtain a t value for Illinois of 0.76, for Mississippi of 0.49, and for the combined States of 0.77.

None of these t values are significant at the 67 or 95 percent level. The low magnitude of these t values indicates that any difference between the two yields could easily be explained by sampling error.

Confidence intervals may be set at the 95 percent level for each State and the combined States as follows:

State	Interval	Harvested yield	Estimated yield
Illinois	25.95-27.37	26.66	26.93
Mississippi	22.91-24.55	23.73	23.93
Two States combined...........	24.30-25.44	24.87	25.10

In all three instances, the estimated yield is well within the confidence interval derived from the estimated variance and the population harvested yield. Of the differences between the estimated and harvested yields by fields, five are negative and seven are positive. This suggests that no constant bias exists in one direction. The differences between yields were nearly offsetting, with a difference of only 0.27 bushel in Illinois and 0.20 bushel in Mississippi. The harvested yield for all fields except one in each State is within the 95 percent confidence interval. For these two fields, this suggests either (1) two unlikely combinations of sampling units occurred, or (2) there existed some departure in procedure which produced the larger differences. The fact that both these significant differences were positive suggests the possibility of a departure from procedure. However, if such differences occur rather infrequently, it may be that they are associated with some field or yield characteristic.

Conclusion

The small differences between estimated yields and harvested yields are not significant and may be attributed to sampling error. The hypothesis of no difference between estimated and measured yield is not refuted, and the conclusion follows that any bias in field procedures is insignificant and negligible.

Book Reviews

International Explorations of Agricultural Economics

Edited by Roger Dixey. Iowa State University Press, Ames. 306 pages. 1964. $7.50.

ACCORDING TO its subtitle, this book was conceived and dedicated as "A Tribute to the Inspiration of Leonard Knight Elmhirst," founder and, for nearly 30 years, president of the International Conference of Agricultural Economists (now the International Association of Agricultural Economists). It is an unusual book in several respects. Not only is it an enduring testimonial to a living leader in his chosen profession, it is also an expression of the esteem in which he is held as a leader and as a person by the international community of his professional colleagues. The publication of the book was sponsored by the International Association of Agricultural Economists and was made possible by voluntary financial contributions from the membership throughout the world.

The book is unusual also for its contents. The 25 substantive chapters--written by authors from 24 countries--deal with different topics in agricultural economics, each relating to important aspects of the agriculture of the country concerned. Only two of the authors are from the United States; the others are from western and eastern European countries, from Latin America, India, Ceylon, the Philippines, Japan, Israel, and the United Arab Republic.

The great diversity of the topics discussed in the various chapters makes it difficult to adequately described its contents or to appraise specific contributions. Some of the chapters are devoted to conceptual or methodological aspects, as for example, the chapter on "Three Concepts of Agricultural Over-population" by Rudolf Bićanić from Yugoslavia, the one on "The Application of Production Functions in Economic-Agricultural Investigations" by Anatol Brzoza of Poland, and another chapter on "Resource Use and Productivity in Portuguese Agriculture" by Fernando Estácio of Portugal which also applies the production function technique. There are some outstanding analytical chapters, such as the one by Sherman Johnson, "The Agricultural Economist and the Welfare of Farm People"; the chapter by Yehuda Lowe of Israel, devoted to a comparative economic analysis of the kibbutz and the moshav, the two major types of cooperative farming organization in Israel; or the chapter on "Concurrent Growth of Agriculture with Industry: A Study of the Japanese Case" by Professor Kazushi Ohkawa. Other chapters could also be cited, both for the quality of contribution and for the subject matter interest, although it is recognized that different readers would form different subjective opinions. It is interesting to note that both the author from Yugoslavia and the author from Poland discussed research subjects having fairly universal application, whereas the chapter by I. S. Kuvshinov from the U.S.S.R. is limited to a brief description of the collective farms of the U.S.S.R., presented in the expected doctrinaire manner.

The book is a sampling of current agricultural economics writings throughout the world. While the chapters vary in degree of economic sophistication, all of them deal with significant agricultural problems and reflect a great deal of progress among developing as well as developed countries in agricultural economics as a scientific discipline. The chapter by George Boublat of Belgium provides a convenient summary of the status of research in agricultural economics in western European countries, while that of R. M. Paiva of Brazil discusses types of agricultural economic research deemed useful in underdeveloped countries. It is gratifying to note in this volume the number of chapters devoted to the broader problems of socioeconomic analysis and the focus on development of rural people,

as contrasted with the older tradition in agricultural economics which emphasized the microeconomic aspects.

The book, as a whole, provides interesting and useful insights into agricultural conditions in the large number of countries covered. It is a fitting tribute to international communication and understanding fostered by Leonard Knight Elmhirst and the International Association of Agricultural Economists.

Louis J. Ducoff

The Balance of Payments Statistics of the United States; A Review and Appraisal

Report of the Review Committee for Balance of Payments Statistics to the Bureau of the Budget. Washington, D.C. 194 pages. 1965. $1.50.

WITH THE present U.S. payments problem and the attention given to correct the imbalance, this report is particularly timely. It is an overall appraisal of problems associated with the balance-of-payments concepts of measuring surpluses or deficits, problems of presentation and analyses, and the technical problems of collecting statistical data and making estimates. The Review Committee examined the purposes for which balance-of-payments statistics are needed--they are the basis for policy decisions, both domestic and international in application. It also examined the scope and quality of the statistics, taking into account new types of complex international transactions and establishing new benchmarks; and the methods by which data are collected, processed, and presented to the public. The Committee devoted considerable attention to the need for defining a balance-of-payments surplus or deficit (Part III).

The Review Committee recommended measuring the balance-of-payments deficit (or surplus) in terms of one group of transactions--"official settlements." By this measure, the deficit in 1964 would be $1.5 billion, compared to $3.1 billion computed on the basis of regular types of transactions. However, the notion that the balance-of-payments position can be ascertained in terms of a single summary concept, the surplus or deficit, is rejected. The analogy is made that economists do not analyze economic activity in the United States solely on the basis of GNP, but study the many components and underlying forces reflected in this social accounting statement.

The Review Committee stated that a new version of the balance-of-payments manual--a supplement to the Survey of Current Business--is urgently needed; the last manual was published in 1952. Further, Federal agencies other than the Department of Commerce which collect data on international transactions for inclusion in the balance-of-payments estimates should also publish new descriptions of their methodology. The Department of Agriculture is responsible for administering several significant international operations, particularly under the Agricultural Trade Development and Assistance Act (P.L. 480). International transactions of a grant or capital type authorized under P.L. 480 entering the U.S. balance of payments averaged $1.5 billion annually in recent years. Summarized data on many of these transactions are regularly reported for subsequent entry into the payments accounts.

Until a new version of the payments manual is available, the Review Committee's report, together with the balance-of-payments information regularly published in the Survey of Current Business, provides a very useful record of the attention being devoted to improving this segment of the U.S. social accounts. This report will be useful to economists in universities and in business as well as to other users of the balance-of-payments statistics.

McGehee H. Spears

Agricultural Development in Tanganyika

By Hans Ruthenberg. Springer Verlag, Berlin and New York. 212 pages. 1964. $7.

WHAT HAS BEEN the impact of foreign aid and technical assistance programs in Tanganyika during this century? How and when should aid be administered to the underdeveloped countries of Africa south of the Sahara?

Ruthenberg presents a lucidly and carefully written study in an attempt to find answers to these puzzling problems. His study is the result of a search for a "strategy" for the agricultural development of Tanganyika.

The author makes a pragmatic appraisal of Tanganyika's agricultural development from 1900 to the present. After an introductory survey of the present agricultural conditions in Tanganyika, he appraises and evaluates the German era in Tanganyika and the British Colonial Government's attempt to develop farming and increase agricultural productivity between 1950 to 1960.

The study is divided into six chapters: (1) The Role of Agriculture in the Economic Development of Tanganyika; (2) A Brief Survey of the Agricultural Situation in Tanganyika; (3) Achievements of Tanganyika's Agriculture; (4) Agricultural Development Policy under British Administration; (5) Agricultural Development Policy in the First Year of Independence; and (6) Agricultural Development Aid: Some General Observations Based on Conditions in Tanganyika. In an appendix the author analyzes and appraises (a) Technical-Economic Approaches to Agricultural Development in Tanganyika and (b) Market Boards and Market Controls. An extensive bibliography on Tanganyika's agricultural development is also included.

Ruthenberg makes excellent use of specific case studies to illustrate how intensive methods of agriculture were tried on farms in various regions of the country, and why some of the projects failed to develop and why other projects were effective. The author's observations on the introduction of irrigation, improved farming techniques, and other innovations into Tanganyika are noteworthy. Through trial and error the British colonial administration intensified farm production in Tanganyika in a way which proved to be economical and effective. This farming strategy, however, became effective only toward the end of British rule and subsequently decayed.

The new Government of Tanganyika, according to Ruthenberg, cannot continue in the footsteps of the British administration, but has to adjust to a new political and economic situation and consequently must seek new concepts for agricultural transformation and development. The author makes a plea for more research, particularly in agricultural marketing and input-output analyses for Tanganyika and other African countries south of the Sahara.

This study should be read and used by Government officials, AID administrators, agricultural economists, and academicians working on agricultural problems of Africa south of the Sahara.

Carey B. Singleton, Jr.

Agricultural Market Analysis

Edited by Vernon L. Sorenson. Michigan State University, East Lansing. 344 pages. 1964. $7.

THIS BOOK is the product of a committee, and is plagued by the problems that characterize such efforts. The editor has achieved smoothness in presentation and flow, only in the words, not in the ideas. Each contribution stands largely by itself as it might in a journal--the concepts developed in one article are seldom brought to bear on those in another.

Thus this book is largely a collection of articles on agricultural marketing, presented in four parts. The first deals with the socioeconomic aspects of marketing and the role of marketing in economic development. The second discusses firm behavior, market structure, imperfect competition, advertising, quality competition, firm growth in different dimensions, group action, and cooperatives. The third deals with the aggregate view of markets. The last engages in a review of some aspects of public policy in marketing.

The discussions of socioeconomic variables, principally in the early part of the book, are of some academic interest but do little to improve our ability to analyze markets. Much of this material seems to involve classification for classification's sake. There is virtually no attempt to show how these variables are linked with fundamental market relations. And, there is even less attempt to show how these variables can be measured and brought to bear on practical market problems.

The economic conceptualizations are usually of the accepted variety and, therefore, offer few additional insights that are not available in the

literature from which they originated. In some sections the concepts are handled with moderate rigor, but in others they are treated ambiguously and may do little to improve understanding.

Oswald P. Blaich

Economics of the Livestock-Meat Industry

By Willard F. Williams and Thomas J. Stout. The MacMillan Company, New York. 802 pages. 1964. $14.95.

FACTS FILL almost 800 pages of this book. It begins with the livestock industry as of 1493 and ends with "The Future." Brevity is not a virtue of these authors, but brevity would not have suited such an understanding. The book will make an excellent reference for livestock economists and students of livestock economics.

Just as Rutherford has shown that the atom is not a substantial "billiard ball" but more like a little "solar system," Williams and Stout have illustrated the livestock economy as a system where marketing, transportation, pricing, demand, and supply of livestock are locked in a balance about a historical setting.

A large part of the book is devoted to the development and operation of the livestock marketing industry. The authors present a detailed description, with some suggestions for the improvement of markets. A number of suggestions for auctions, such as "it generally is considered desirable to have information on weights made available prior to the actual bidding," and sorting of livestock by both grade and weight into uniform lots, are, I think, quite desirable.

Pricing information from several sources is discussed. The Federal Market News Service and Statistical Reporting Service are said to have grown "like Topsy," "usually without benefit of research on questions regarding (1) economic justification of the proposed work, (2) significant gaps in the information from national and interindustry viewpoints and (3) probable marginal benefits of alternative proposals." I find it hard to believe that the work of any Government agency is not examined, evaluated, justified, and rejustified before new programs are started. Most new programs are started because of public demand for new or additional data. The authors also charge that "the high dependence on use of mail questionnaires still is a source of weakness and criticism." Frankly, I can think of no other more efficient and reliable method in terms of money spent than this one.

The last two parts of the book are devoted to public policy and special problem areas, and the future. Again almost no stone is left unturned, with a review of meat inspection, antitrust investigations, the humanitarian "28-hour law," the humane slaughter act of 1958, interstate regulation, and so on. The account of the battle with animal diseases by the veterinarians of the USDA begins with the sticky problem of hog cholera, includes the eradication of contagious pleuropneumonia at a cost of more than $1.5 million, and ends with the conclusion that "trends suggest that the role of Government, as it affects the industry, will grow."

"The Future" is discussed in the last 32 pages, with projected per capita meat consumption being between 215 and 245 pounds for the year 2000. No technological shocks comparable to the adoption of truck transportation and artificial refrigeration are anticipated, but improved techniques for tenderizing meat and preserving freshness are expected. The authors also discuss changes in the marketing system and regional changes in production. In essence, the authors take each problem in the livestock economy from the mass of economic phenomena and give it individuality.

Forrest E. Walters

A Review of Community Economic Development Efforts: Five Case Studies

By the Committee for Economic Development. New York. 349 pages. 1964. $2.75.

TO QUOTE FROM the opening remarks of the Director of Area Development, CED: "The following studies were undertaken primarily to learn about the process of readjustment: what these communities did effectively

for themselves; what was the role of individual action by workers, investors, and employers--the free market process; and, rather incidentally, what was the impact of units of government at the State and Federal levels."

The five case studies in the report are: (1) The Economic Redevelopment of the Burlington, Vt., area; (2) Economic Development Efforts in the Utica-Rome, N.Y., area; (3) Chronic Unemployment in Altoona, Pa.; (4) Economic Redevelopment for Evansville, Ind.: A Case Study of a Depressed City; and (5) Helena-West Helena, Ark.: A Case Study in Economic Readjustment. Each of these studies brought to focus the interrelationships of the city with the outlying area. The Evansville study, in particular, points out the relation between employment levels in farming and in the city.

Of all the cases presented, Helena-West Helena, Ark., had the fewest people and was most dependent upon agriculture. The decline in the importance of farming as a job creator seriously hurt this area and left many people without a job. Associated with this decline was a poorly educated and trained labor force, half of which was Negro. The case study of Helena-West Helena pays little attention to the causes of the low quality of labor. No mention is made of the history of education in the area and how this might guide future decisions, although the report indicates that, since 1961, more emphasis is being placed on education and training. This particular study could have been of significant interest to agricultural economists; however, it is the least comprehensive of all the cases presented.

The Altoona, Pa., and Evansville, Ind., studies best came to grips with the broad range of factors that affected development in those areas. The Altoona study emphasized the importance of railroad employment. The problems associated with extreme loyalty to the railroad were laid out and discussed. For Evansville, community apathy associated with the loss of several large firms was analyzed, as well as the poor timing of the actions of certain local development groups. Bickering between the various groups led to the employment of an outside firm to analyze local problems.

I would recommend that case studies of various industries be conducted. These studies could include small, medium, and large companies as well as those in declining and growing industries. With the community and industry studies as background, a local community would be well equipped to determine how and whether it should try to attract industry.

Bernard Hoffnar

Selected Recent Research Publications in Agricultural Economics Issued by the U.S. Department of Agriculture and Cooperatively by the State Universities and Colleges[1]

Barlow, Frank D., Jr., and Susan A. Libbin. THE ROLE OF AGRICULTURAL COMMODITY ASSISTANCE IN INTERNATIONAL AID PROGRAMS. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 118, 26 pp., March 1965.

Reviews some trends and highlights of U.S. agricultural commodity aid programs, particularly P.L. 480, and their relationship to commercial agricultural exports and other U.S. foreign economic aid programs. Bilateral food aid programs of other countries and the World Food Program are also discussed.

Bird, Ronald, and Buis T. Inman. INCOME OPPORTUNITIES FOR RURAL FAMILIES FROM OUTDOOR RECREATION ENTERPRISES. U.S. Dept. Agr., Agr. Econ. Rpt. 68, 31 pp., March 1965.

Summarizes data obtained from studies on recreational enterprises in Arkansas, Missouri, New England, Ohio, Oregon, and South Carolina. Cash incomes exceeded cash expenses for 86 percent of the 254 enterprises analyzed. Most of the businesses returned less than $10 a day to operator and family labor.

Brown, Lester R. INCREASING WORLD FOOD OUTPUT: PROBLEMS AND PROSPECTS. U.S. Dept. Agr., Foreign Agr. Econ. Rpt. 25, 140 pp., April 1965.

Higher yields per acre are the principal key to future increases in world food production. To meet food needs, underdeveloped countries must achieve a yield take-off--a rapid increase in yields sustained over a period of several years. To accomplish this, literacy in these countries needs to be increased, incomes must be high enough to permit accumulation of capital, subsistence farmers must become market-oriented, and the nonagricultural economy must be able to support farmers' efforts to raise yields.

Cable, C. Curtis, Jr., Zolon M. Looney, and Charles A. Wilmot. UTILIZATION AND COST OF LABOR FOR GINNING COTTON. U.S. Dept. Agr., Agr. Econ. Rpt. 70, 31 pp., April 1965.

Charges paid by cotton producers for ginning have closely paralleled the rising cost of ginning. Plant labor is one of the most costly inputs used by the ginning industry, accounting for 20 to 25 percent of total cost. The study was made in 1962-63 to develop standards which ginners may use for improving efficiency of plant labor.

Coltrane, R. I., and E. L. Baum. AN ECONOMIC SURVEY OF THE APPALACHIAN REGION, WITH SPECIAL REFERENCE TO AGRICULTURE. U.S. Dept. Agr., Agr. Econ. Rpt. 69, 78 pp., April 1965. (W. Va. Agr. Expt. Sta. cooperating.)

Examines the direction and magnitude of changes that occurred in Appalachia's agriculture and other major industries between 1950 and 1960. Comparisons are made between Appalachia, the surrounding area, and the United States. The comparisons are made to present Appalachia's relative economic position. Intraregional comparisons are also made.

Cooper, Maurice R., and William F. Harris. RECENT DEVELOPMENTS IN TESTING AND PRICING COTTON FOR FINENESS AND STRENGTH. U.S. Dept. Agr., Mktg. Res. Rpt. 699, 33 pp., March 1965. (Univ. Tex. cooperating.)

About half of the cotton shippers operating in 4 Texas markets were interviewed. All of them were using one or more types of information on fineness as guides in buying and selling some of their cotton. Most of them favored including data on fineness for individual bales in USDA classification information, and including differentials for fineness in market quotations and Government loan rates.

Dawson, Robert H., and Robert H. Reed. SOME ASPECTS OF LABOR EFFICIENCY IN CANNING ASPARAGUS SPEARS. Calif. Agr. Expt. Sta., Giannini Found. Res. Rpt. 281, 42 pp., March 1965. (Econ. Res. Serv. cooperating.)

Labor utilization under conventional canning methods is compared with recently developed mechanical presizing equipment. Economic and engineering research procedures were used in a synthesis of labor requirements for a single-product output of green and white asparagus spears.

Droge, John H. RADIATION-PASTEURIZING FRESH STRAWBERRIES AND OTHER FRESH FRUITS AND VEGETABLES: ESTIMATES OF COSTS AND BENEFITS. U.S. Dept. Agr., Econ. Res. Serv., ERS-225, 22 pp., March 1965.

Radiation-pasteurizing of strawberries would reduce spoilage loss by at least enough to pay the cost of treatment, according to preliminary estimates of costs. Additional savings might be realized because the shelf life would be increased, less in-store culling would be needed, and use of carbon dioxide gas as a mold inhibitor could be reduced or eliminated.

[1] State publications may be obtained from the issuing agencies of the respective States.

Freeman, Billy G., R. H. Rogers, and D. S. Moore. PRODUCTION AND PRODUCTION REQUIREMENTS, COSTS AND EXPECTED RETURNS FOR CROP AND LIVESTOCK ENTERPRISES, ROLLING BLACKLAND SOILS OF THE CENTRAL BLACKLAND PRAIRIE OF TEXAS. Texas Agr. Expt. Sta., College Station, MP-752, 78 pp., January 1965. (Econ. Res. Serv. cooperating.)

One of a series of reports designed to help farmers select the most profitable combination of enterprises and practices. Budgets are developed setting forth detailed information on production requirements and expected costs and returns for alternative crop enterprises and rotations and for the major livestock systems in the area studied.

Fuller, Theodore E., and E. L. Baum. EMPLOYMENT, UNEMPLOYMENT, AND LOW INCOMES IN APPALACHIA. U.S. Dept. Agr., Agr. Econ. Rpt. 73, 48 pp., May 1965. (Pa. State Univ. Agr. Expt. Sta. cooperating.)

Appalachia has a disproportionate share of the Nation's unemployed workers and low-income families. Rates of unemployment and percentages of families with low incomes are highest in the more rural subareas with small population centers. Development strategy for Appalachia ought to consider both the amounts of financial resources available for development and a determination of which subareas have growth potential.

Henderson, Peter L., and M. Elton Thigpen. EVALUATION OF A SPECIAL PROMOTIONAL CAMPAIGN FOR FROZEN CONCENTRATED ORANGE JUICE. U.S. Dept. Agr., Mktg. Res. Rpt. 693, 29 pp., February 1965.

A nationwide promotional campaign from September through November 1962 resulted in significantly higher sales of frozen concentrated orange juice during those months and until December 15, 1962. Estimated sales increases attributed to the promotion averaged 168,000 gallons per week. Increased sales were derived primarily from an increase in the number of new users attracted into the market.

Hutchinson, T. Q. PRIVATE MOTOR CARRIERS OF EXEMPT AGRICULTURAL COMMODITIES: NUMBER, LENGTH OF TIME IN BUSINESS, TYPES, AND CAPACITY OF VEHICLES. U.S. Dept. Agr., Mktg. Res. Rpt. 696, 31 pp., March 1965.

In 1961 the 701 private motor carriers in the study reported carrying more than 11 million tons of exempt agricultural commodities. Slightly more than half of their mileage was used in hauling exempt agricultural commodities. Average numbers of vehicles operated per firm were 6 truck tractors, 8 semitrailers, 3 full trailers, and 9 straight trucks.

Irwin, George D. MILK PRODUCTION ALLOTMENT AND CLASS 1 BASE PLANS, MICHIGAN DAIRY FARMS. Mich. State Univ. Dept. Agr. Econ., Agr. Econ. Rpt. 3, 42 pp., March 1965. (Econ. Res. Serv. cooperating.)

Describes four alternatives to blend milk pricing, and discusses producers' possible responses to each one.

Larsen, Marion R. AGRICULTURAL ECONOMY OF NORTH VIETNAM. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 123, 38 pp., April 1965.

Agriculture in North Vietnam accounts for about 50 percent of the national income, provides a livelihood for about 85 percent of the population, and employs almost 80 percent of the labor force. All farming activities and the disposition of production are carried on according to state plan. State farms are exclusively state property and peasants who are employed on them work for wages. Agriculture's disappointing output has increased the country's trade deficit. In 1961 the value of total exports was only 59 percent of total imports.

Mackie, Arthur B. FOREIGN ECONOMIC GROWTH AND MARKET POTENTIALS FOR U.S. AGRICULTURAL PRODUCTS. U.S. Dept. Agr., Foreign Agr. Econ. Rpt. 24, 76 pp., April 1965.

U.S. farm exports, doubling in the last decade, reached $6.1 billion in 1963-64. If past trends continue, U.S. farm exports may increase to $9.5 billion by 1980. The largest market potential for U.S. farm exports is in the less developed countries, and rapid economic growth in these countries is important to steady expansion of U.S. agricultural trade. As income per person rises, consumers in these countries spend a large proportion of their additional income for food.

Manchester, Alden C. NATURE OF COMPETITION IN FLUID MILK MARKETS: MARKET ORGANIZATION AND CONCENTRATION. U.S. Dept. Agr., Agr. Econ. Rpt. 67, 76 pp., February 1965.

The typical city milk market today has two important characteristics: A few firms make most of the sales, and small milk dealers are going out of business. Between 1950 and 1962, the number of handlers decreased nearly half in the 71 markets studied. Concentration--the share of the market held by the 4 largest firms--increased fairly rapidly in smaller markets in this period, and declined slightly in the largest ones.

McCoy, John L. HOMEMAKERS' OPINIONS AND PREFERENCES FOR BROILER-FRYERS AND TURKEYS, A PRELIMINARY REPORT. U.S. Dept. Agr., Statis. Rptg. Serv., SRS-7, 11 pp., May 1965.

The study was designed to provide data on some of the factors influencing the demand for poultry. It contains up-to-date information on consumers' opinions, wants, and criticisms, and can be used in planning efforts for maintaining or improving market positions.

Moede, Herbert H., and Betty Burnside. MARKET POTENTIAL FOR LOW-FAT MILK. U.S. Dept. Agr., Mktg. Res. Rpt. 709, 84 pp., May 1965.

Before 1949, the sale of low-fat milk was apparently limited to the Midwest, but by 1953 this milk was available in each of the major geographic regions. Industrywide sales of low-fat milk totaled an estimated 620 million quarts by the end of 1963. If present trends continue, sales of low-fat milk could reach 1.8 billion quarts by 1970.

Moore, D. S., and R. H. Rogers. PRODUCTION AND PRODUCTION REQUIREMENTS, COSTS AND EXPECTED RETURNS FOR CROP PRODUCTION ON WELL-DRAINED CLAY AND CLAY LOAM SOILS, COASTAL PRAIRIE OF TEXAS. Texas Agr. Expt. Sta. (College Station), MP-756, 49 pp., February 1965. (Econ. Res. Serv. cooperating.)

One of a series of reports designed to help farmers select the most profitable combination of enterprises and practices. Budgets are developed setting forth detailed information on production requirements and expected costs and returns for the major field crops and cropping systems that are most suitable for the area studied.

Nelson, Paul E., Jr. MARKET NEWS DISSEMINATION IN THE SOUTHWEST: HOW THE FEED GRAIN AND LIVESTOCK INDUSTRIES OBTAIN AND EVALUATE MARKET INFORMATION. U.S. Dept. Agr., Agr. Econ. Rpt. 71, 19 pp., April 1965.

Summarizes and analyzes the use and evaluation of market information by 201 farmers and 205 tradesmen in the feed grain and livestock industries of Arizona, Kansas, New Mexico, Oklahoma, and Texas. The farmers and tradesmen reported their use of specific information media including daily and trade newspapers, TV, newsletters, and others.

Pike, Clarence E. SUPPLY OF AND DEMAND FOR SELECTED AGRICULTURAL PRODUCTS IN INDIA: PROJECTIONS TO 1975-76. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 100, 27 pp.

Summarizes a report published in India in 1962 by the National Council of Applied Economic Research. Some overall conclusions regarding the prospective future supply of and demand for selected agricultural commodities, and their implications for U.S. agriculture, are given.

Potter, Joseph R., Jr. THE TRAFFIC PATTERN OF AMERICAN RAW COTTON SHIPMENTS, SEASON 1961-62. U.S. Dept. Agr., Mktg. Res. Rpt. 705, 35 pp., April 1965.

Of the total 1961-62 movement of cotton, 47 percent went to mills in Southeastern States, 29 percent to ports for export or reconcentration, and 13 percent was intrastate traffic. About 4 percent was shipped to interior concentration points and 3 percent to Canada. Trucks handled about one-quarter of the raw cotton moved; the rest was transported by railroads.

Powell, Jules V., and Victor G. Edman. MARKETING FLOWERS: CREDIT AND FINANCING PROBLEMS OF RETAIL AND WHOLESALE FLORISTS IN FOUR IOWA CITIES. U.S. Dept. Agr., Mktg. Res. Rpt. 704, 28 pp., April 1965.

Operating practices and credit policies of high- and low-loss firms were compared to determine factors affecting losses from noncollectible accounts. The authors conclude that losses from bad debts are not as high as had been supposed. Firms with flexible bill-collecting procedures tended to have lower losses from bad debts than firms with rigid billing procedures.

Reese, Robert B. ESTABLISHING CENTRAL SCHOOL LUNCH KITCHENS IN URBAN AREAS: PROBLEMS AND COSTS. U.S. Dept. Agr., Agr. Econ. Rpt. 72, 61 pp., May 1965.

Reports findings of a study of ways to extend availability of the National School Lunch Program to urban children in old school buildings lacking kitchens or means for installing them--particularly schools in low-income neighborhoods where the need is greatest. Procedures developed may also be applicable to rural schools in economically depressed areas.

Skinner, Snider W. THE CONGO'S AGRICULTURAL ECONOMY IN BRIEF. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 121, 8 pp., April 1965.

Describes current agricultural and trade practices in the Congo (Leopoldville) and cites the damper put on agriculture by unsettled conditions since attainment of independence in 1960. Only 2 percent of the land is used for farming.

Smith, Helen V. RAILROAD FREIGHT RATE INDEXES FOR FARM PRODUCTS, 1957-63. U.S. Dept. Agr., Statis. Bul. 358, 22 pp., April 1965.

Freight rate indexes of 33 farm commodities are updated and brought into line with other Government

indexes. These indexes, used to measure the average yearly changes in prices paid for transporting farm commodities from the origin of shipments to marketing destination, are revised every decade by USDA.

Spiegelman, Robert F., E. L. Baum, and L. E. Talbert. APPLICATION OF ACTIVITY ANALYSIS TO REGIONAL DEVELOPMENT PLANNING: A CASE STUDY OF ECONOMIC PLANNING IN RURAL SOUTH CENTRAL KENTUCKY. U.S. Dept. Agr., Tech. Bul. 1339, 89 pp., March 1965.

The report is concerned with the development and utilization of an econometric model for planning economic development in small rural areas. The model is a highly disaggregated form of linear programming. It contains a pricing mechanism that tends to make the optimal solution conform to a competitive solution for the area. The methodology used in the study permits an internal check as to whether the proposed development area is a satisfactory size for analysis and planning.

Stevens, Robert D. ELASTICITY OF FOOD CONSUMPTION ASSOCIATED WITH CHANGES IN INCOME IN DEVELOPING COUNTRIES. U.S. Dept. Agr., Foreign Agr. Econ. Rpt. 23, 85 pp., March 1965.

Six measures of food used, covering the various levels of consumption and flow of food from the farm to the consumer, were chosen for analysis. An Engel Curve for food was derived from consumption data for many countries. The analysis provides evidence that the income elasticity of total food consumption per capita must range between 0.9 and 0.4 over the long term.

Waldorf, William H., and Hazen F. Gale. OUTPUT PER MAN-HOUR IN DISTRIBUTING FOODS OF FARM ORIGIN. U.S. Dept. Agr., Tech. Bul. 1335, 24 pp., April 1965.

Output per man-hour employed in distributing foods of domestic farm origin increased at an average rate of 2.5 percent per year from 1929 to 1958. The most important factor in the rise in labor productivity was the shift from clerk to self-service stores. Productivity estimates in the report were developed as part of an investigation by USDA of factors affecting the demand, the supply, and the productivity of farm food marketing services.

U.S. Department of Agriculture. FARM-RETAIL SPREADS FOR FOOD PRODUCTS 1947-64. Econ. Res. Serv., ERS-226, 45 pp., April 1965.

Presents revised farm-food market basket statistics, with changes in the products in the market basket, in weights assigned to individual products, in retail prices, and in methods and data used in calculating farm values. The weights used were calculated from a consumer expenditures survey conducted by the Bureau of Labor Statistics in 1960-61.

U.S. Department of Agriculture. FOOD BALANCES FOR 30 COUNTRIES IN AFRICA AND WEST ASIA, 1959-61. Econ. Res. Serv., ERS-Foreign 119, 33 pp., March 1965.

Agriculture in the area studied is mainly of the subsistence type, although oil palm products, cocoa, long-staple cotton, dates, and other products are exported. Food consumption per person, in terms of calories, is generally low. Average per capita income is about $100 for Africa and about $200 for West Asia.

U.S. Department of Agriculture. JAMAICA, TRINIDAD AND TOBAGO, LEEWARD ISLANDS, WINDWARD ISLANDS, BARBADOS, AND BRITISH GUIANA, PROJECTED LEVELS OF DEMAND, SUPPLY, AND IMPORTS OF AGRICULTURAL PRODUCTS TO 1975. Econ. Res. Serv., ERS-Foreign 94, 221 pp.

The study was made under contract between USDA and the Institute of Social and Economic Research, University College of the West Indies, Jamaica. The area studied represents a small but important and rapidly growing market for U.S. agricultural exports. Such exports totaled $20.7 million in 1958 and reached $30.5 million in 1962. U.S. agricultural exports to the area in 1962 represented 7 percent of the total for Latin America.

U.S. Department of Agriculture. SOIL AND WATER CONSERVATION NEEDS: A NATIONAL INVENTORY. Conservation Needs Inventory Committee, U.S. Dept. Agr., Misc. Pub. 971, 94 pp., 1965.

Soil erosion is still the dominant conservation problem on the non-Federal rural land of the United States. Nearly two-thirds of the land covered by the inventory still needs conservation treatment of some kind. The publication is a narrative interpretation of the statistical summary of the inventory released by the Department in 1962. In it, experts of the eight agencies that make up the Conservation Needs Inventory Committee of the Department evaluate the findings of the study based on field work conducted in 3,000 counties from 1957 to 1959.

U.S. Department of Agriculture. SOVIET FOREIGN AGRICULTURAL TRADE 1962-63. Econ. Res. Serv., ERS-Foreign 120, 22 pp., March 1965.

Soviet agricultural trade in 1962 and 1963 was marked by declining imports of sugar from Cuba and a sharp cutback in grain exports. The Soviet Union sends about 75 percent of its farm exports to Communist countries. Less than half of Soviet agricultural imports came from Communist countries in 1962 and 1963.

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U.S. Department of Agriculture. THE 1965 AFRICA AND WEST ASIA AGRICULTURAL SITUATION. Econ. Res. Serv., ERS-Foreign 117, 91 pp., March 1965.

Farm output in West Asia for 1965 was about 1½ percent below the relatively high level of 1963. Output of all principal crops and most livestock products remained above the drought-depressed levels of 1959-61. Total agricultural output in northern Africa for 1964/65 showed a modest increase over that of 1963/64; agricultural production in Africa south of the Sahara for 1964/65 is expected to be about 4 percent over 1963/64.

U.S. Department of Agriculture. THE 1965 EASTERN EUROPE AGRICULTURAL SITUATION. Econ. Res. Serv., ERS-Foreign 115, 54 pp., March 1965.

The report describes the production and Government procurements of farm products in Eastern Europe in 1964-65 compared with earlier seasons. With considerably better weather in many important regions, agriculture in the Soviet Union recovered from the unusually low output of 1963-64. Throughout Eastern Europe, agricultural production increased slightly. Czechoslovakia was the exception. Agricultural output there continued to decline for the third consecutive year.

U.S. Department of Agriculture. THE 1965 FAR EAST, COMMUNIST CHINA, OCEANIA AGRICULTURAL SITUATION. Econ. Res. Serv., ERS-Foreign 116, 68 pp., February 1965.

Total agricultural production in the Far East made limited gains in 1964. Indonesia, Japan, Taiwan, and South Vietnam made a good gain over 1964 but the Philippines showed no change. Reduced yields and possible harvest losses due to bad weather may have spoiled an otherwise successful agricultural year for Mainland China. In Australia, total farm output in 1964/65 is expected to increase 1.7 percent over 1963/64.

Statistical Compilations

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